

INTERNATIONAL STANDARD

ISO 6164

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Hydraulic fluid power — Four-screw, one-piece square-flange connections for use at pressures of 25 MPa and 40 MPa (250 bar and 400 bar)

*Transmissions hydrauliques — Brides de raccordement carrées monobloc
à quatre vis pour des pressions d'utilisation de 25 MPa et 40 MPa
(250 bar et 400 bar)*



Reference number
ISO 6164:1994(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 6164 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 4, *Connectors and similar products and components*.

Annexes A and B of this International Standard are for information only.

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Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit. Components are interconnected through their ports and associated fluid conductor fitting ends.

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Hydraulic fluid power — Four-screw, one-piece square-flange connections for use at pressures of 25 MPa and 40 MPa (250 bar and 400 bar)

1 Scope

This International Standard gives complete general and dimensional specifications for four-screw, one-piece square-flange connections for use at pressures of 25 MPa and 40 MPa (250 bar¹⁾ and 400 bar).

For flange connections, a design factor of 2,5 is valid, not including weld joints, for which special instructions exist.

This International Standard also specifies the dimensions of the seals to be used, as well as the grooves to house the seals.

These connections are intended for application in hydraulic systems, on industrial and commercial products, where it is desired to avoid the use of threaded connections.

Surges of pressure higher than the nominal ratings will reduce the ability of the flange connections to retain the hydraulic fluid and this should be taken into account in the design of the hydraulic system.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

1) 1 bar = 0,1 MPa = 10⁵ Pa; 1 Pa = 1 N/m²

Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 261:1973, *ISO general purpose metric screw threads — General plan.*

ISO 273:1979, *Fasteners — Clearance holes for bolts and screws.*

ISO 630:1980, *Structural steels.*

ISO 724:1993, *ISO general-purpose metric screw threads — Basic dimensions.*

ISO 898-1:1988, *Mechanical properties of fasteners — Part 1: Bolts, screws and studs.*

ISO 898-2:1992, *Mechanical properties of fasteners — Part 2: Nuts with specified proof load values — Coarse thread.*

ISO 2768-1:1989, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications.*

ISO 3601-1:1988, *Fluid systems — Sealing devices — O-rings — Part 1: Inside diameters, cross-sections, tolerances and size identification code.*

ISO 5598:1985, *Fluid power systems and components — Vocabulary.*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 5598 apply.

4 Material

4.1 Use screws of property class 8.8 or 10.9, as specified in ISO 898-1.

4.2 Use nuts of property class 10, as specified in ISO 898-2.

4.3 Use flanges made of Fe 510 C steel or steel with minimum equivalent mechanical characteristics (structural steel in accordance with ISO 630).

4.4 Use flange heads made of Fe 360 C steel or weldable steel with minimum equivalent mechanical characteristics (structural steel in accordance with ISO 630).

5 Dimensions

5.1 For dimensions of the flanged joint and flanged connection assemblies, see figure 1 and tables 1 and 2.

5.2 Select square flanges in accordance with figures 2 and 3, and tables 3 and 4.

5.3 Select flange heads in accordance with figure 5 and tables 5 and 6.

5.4 Select seals and housing grooves in accordance with figures 4 and 5, and tables 5 and 6.

NOTES

1 Flange heads with seals can house O-rings or other seals that fit the same groove.

2 Flange heads without seals are used in conjunction with tubing, connected to a flange head with a seal.

6 Finish

Refer to figures 2 and 5 for specific finish requirements.

7 Identification statement (Reference to this International Standard)

Use the following statement in test reports, catalogues and sales literature when electing to comply with this International Standard:

"Four-screw, one-piece square-flange connections in accordance with ISO 6164:1994, *Hydraulic fluid power — Four-screw, one-piece square-flange connections for use at pressures of 25 MPa and 40 MPa (250 bar and 400 bar).*"

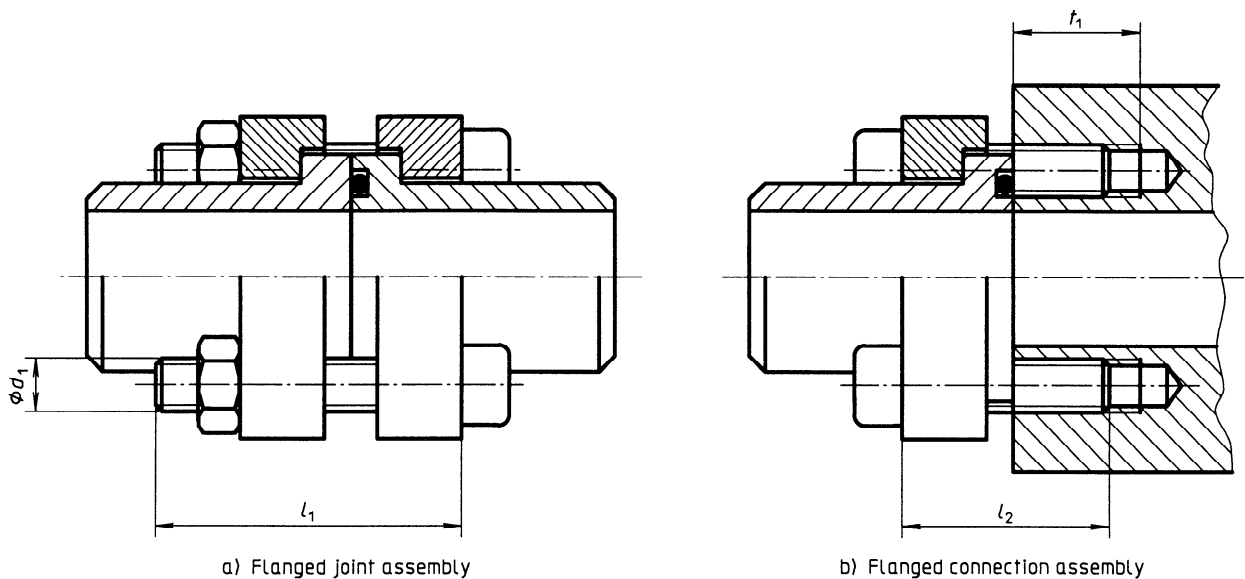


Figure 1 — Dimensions of flanged joint and flanged connection assemblies — 25 MPa and 40 MPa (250 bar and 400 bar) series (see tables 1 and 2)

Table 1 — Dimensions of flanged joint and flanged connection assemblies — 25 MPa (250 bar) series
Dimensions in millimetres

Nominal flange size DN	O-ring ¹⁾	Screw			Thread length l_1 ⁴⁾ min.	Screw torque ²⁾ N·m
		d_1 ³⁾	l_1 ⁴⁾	l_2 ⁴⁾		
10	17 × 2,65	M6 × 1	45	30	12,5	10
13	19 × 3,55	M8 × 1,25	50	35	15,5	25
19	25 × 3,55	M8 × 1,25	55	35	13,5	25
25	32,5 × 3,55	M10 × 1,5	65	40	15,5	53
32	37,5 × 3,55	M12 × 1,75	75	50	20,5	95
38	47,5 × 3,55	M16 × 2	90	60	24,5	220
51	56 × 3,55	M16 × 2	100	65	25,5	220
56	69 × 3,55	M20 × 2,5	110	80	33	390
63	85 × 3,55	M20 × 2,5	120	90	33	390

1) See ISO 3601-1. (Annex A gives the equivalent SAE O-rings.)

2) These torque values are only a guide when using lubricated screws of property class 8.8, as specified in ISO 898-1, calculated with a coefficient of friction of 0,2. Net tightening torque depends on many factors, including lubrication, coating and surface finish. When flange head screws of property class 10.9 or class 10.9 screws with heat-treated washers are used to increase the design factor, the recommended torque values may be increased by 25 %.

CAUTION — It is important that all screws be lightly torqued before applying the final recommended torque values to avoid breaking the flange during installation.

3) Thread in accordance with ISO 724, with coarse pitch in accordance with ISO 261.

4) Recommended dimensions. Screw lengths are calculated for steel; use of other materials may require different screw lengths.

Table 2 — Dimensions of flanged joint and flanged connection assemblies — 40 MPa (400 bar) series
Dimensions in millimetres

Nominal flange size DN	O-ring ¹⁾	Screw			Thread length t_1 ⁴⁾ min.	Screw torque ²⁾ N·m
		d_1 ³⁾	l_1 ⁴⁾	l_2 ⁴⁾		
10	17 × 2,65	M6 × 1	45	30	12,5	10
13	19 × 3,55	M8 × 1,25	50	35	15,5	25
19	25 × 3,55	M8 × 1,25	55	35	13,5	25
25	32,5 × 3,55	M10 × 1,5	65	40	15,5	53
32	37,5 × 3,55	M12 × 1,75	75	50	20,5	95
38	47,5 × 3,55	M16 × 2	90	60	24,5	220
51	56 × 5,3	M16 × 2	100	65	25,5	220
56	69 × 5,3	M20 × 2,5	130	80	31	390
63	75 × 5,3	M24 × 3	130	90	37,5	800
70	85 × 5,3	M24 × 3	150	100	38,5	800
80	87,5 × 5,3	M30 × 3,5	170	120	48,5	1 600

1) See ISO 3601-1. (Annex A gives the equivalent SAE O-rings.)

2) These torque values are only a guide when using lubricated screws of property class 8.8, as specified in ISO 898-1, calculated with a coefficient of friction of 0,2. Net tightening torque depends on many factors, including lubrication, coating and surface finish. When flange head screws of property class 10.9 or class 10.9 screws with heat-treated washers are used to increase the design factor, the recommended torque values may be increased by 25 %.

CAUTION — It is important that all screws be lightly torqued before applying the final recommended torque values to avoid breaking the flange during installation.

3) Thread in accordance with ISO 724, with coarse pitch in accordance with ISO 261.

4) Recommended dimensions. Screw lengths are calculated for steel; use of other materials may require different screw lengths.

Dimensions in millimetres,
surface roughness in micrometres

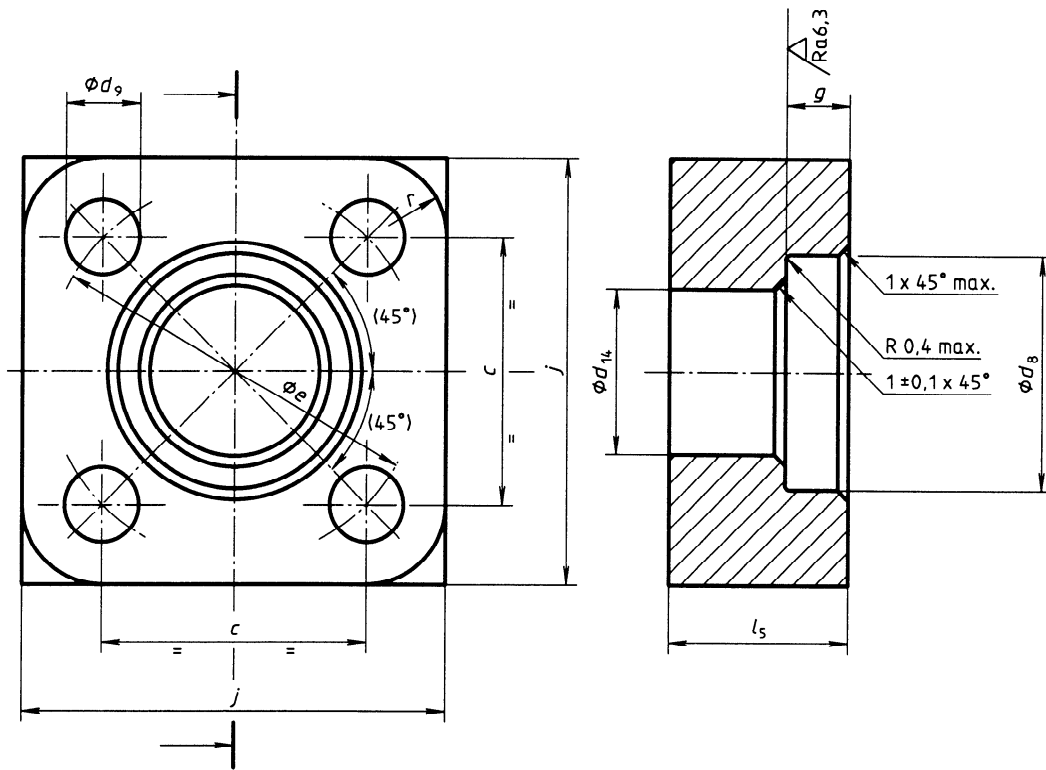


Figure 2 — Dimensions of flanges — 25 MPa and 40 MPa (250 bar and 400 bar) series (see tables 3 and 4)

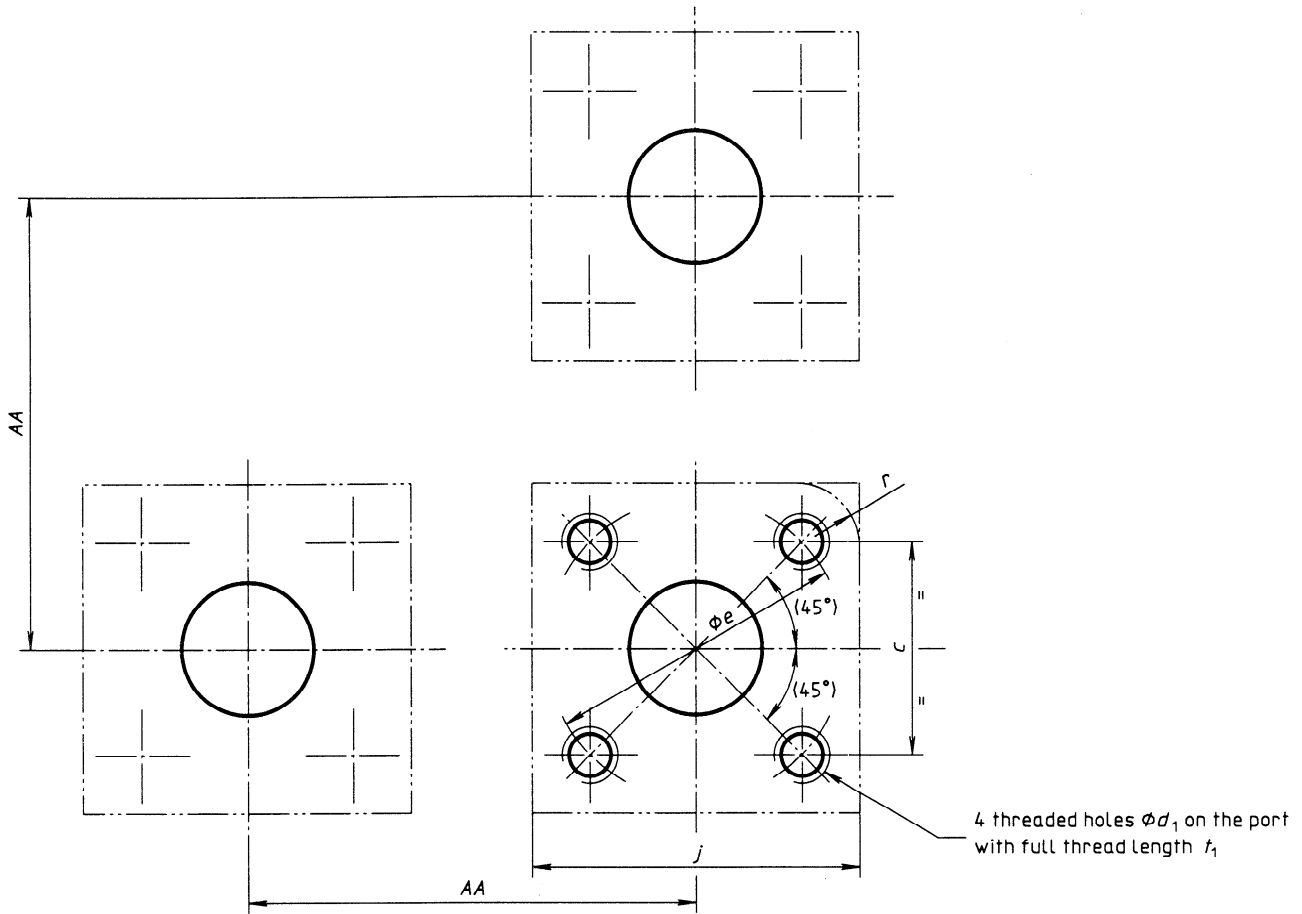


Figure 3 — Port dimensions for flange connections (see tables 3 and 4)

Table 3 — Dimensions of flanges — 25 MPa (250 bar) series

Dimensions in millimetres

Nominal flange size DN	AA ¹⁾	c	d ₈ H12	d ₉ ²⁾ H13	d ₁₄ H11	e ± 0,2	g 0 -0,25	j	l ₅ ³⁾	r ⁴⁾ max.
10	43	24,7	25	6,6	18,5	35	6,2	40	18	6
13	48	29,7	31	9	24,3	42	6,2	45	20	8
19	53	35,4	38,9	9	32,2	50	6,2	50	22	8
25	68	43,8	45,3	11	38,5	62	7,5	65	25	10
32	80	51,6	51,6	13,5	43,7	73	7,5	75	30	12
38	95	60,1	61,1	17,5	50,8	85	7,5	90	36	14
51	105	69,3	72,3	17,5	62,8	98	9	100	40	16
56	125	83,4	88	22	76,6	118	9	120	45	20
63	145	102,5	102,3	22	90,8	145	9	140	52	20

1) Recommended dimensions.

2) In accordance with ISO 273, medium series.

3) The upper face of the flange may have any form. However, the supporting face of the screw heads shall be compatible with dimensions g and l₅. The upper part of the flanges shall not restrict the welding. Tolerances shall be in accordance with ISO 2768-1, tolerance class m.

4) Optional.

Table 4 — Dimensions of flanges — 40 MPa (400 bar) series

Dimensions in millimetres

Nominal flange size DN	AA ¹⁾	c	d ₈ H12	d ₉ ²⁾ H13	d ₁₄ H11	e ± 0,2	g 0 -0,25	j	l ₅ ³⁾	r ⁴⁾ max.
10	43	24,7	26,4	6,6	18,5	35	7,2	40	18	6
13	48	29,7	32,6	9	24,7	42	7,2	45	20	8
19	53	35,4	42,1	9	32,5	50	8,2	50	22	8
25	68	43,8	48,4	11	38,9	62	9	65	25	10
32	80	51,6	54,8	13,5	44,6	73	9,8	75	30	12
38	95	60,1	64,3	17,5	51,6	85	12	90	36	14
51	105	69,3	80,2	17,5	67,6	98	12	100	40	16
56	125	83,4	95	22	80,5	118	16,1	120	50	20
63	155	102,5	111	26	90,5	145	16,1	150	52	20
70	165	113,1	120	26	102,5	160	17,5	160	60	20
80	185	123,7	136	33	114,5	175	21	180	70	24

1) Recommended dimensions.

2) In accordance with ISO 273, medium series.

3) The upper face of the flange may have any form. However, the supporting face of the screw heads shall be compatible with dimensions g and l₅. The upper part of the flanges shall not restrict the welding. Tolerances shall be in accordance with ISO 2768-1, tolerance class m.

4) Optional.

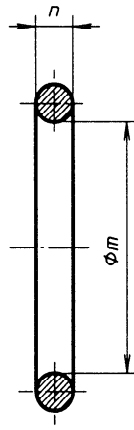


Figure 4 — O-ring (see tables 5 and 6)

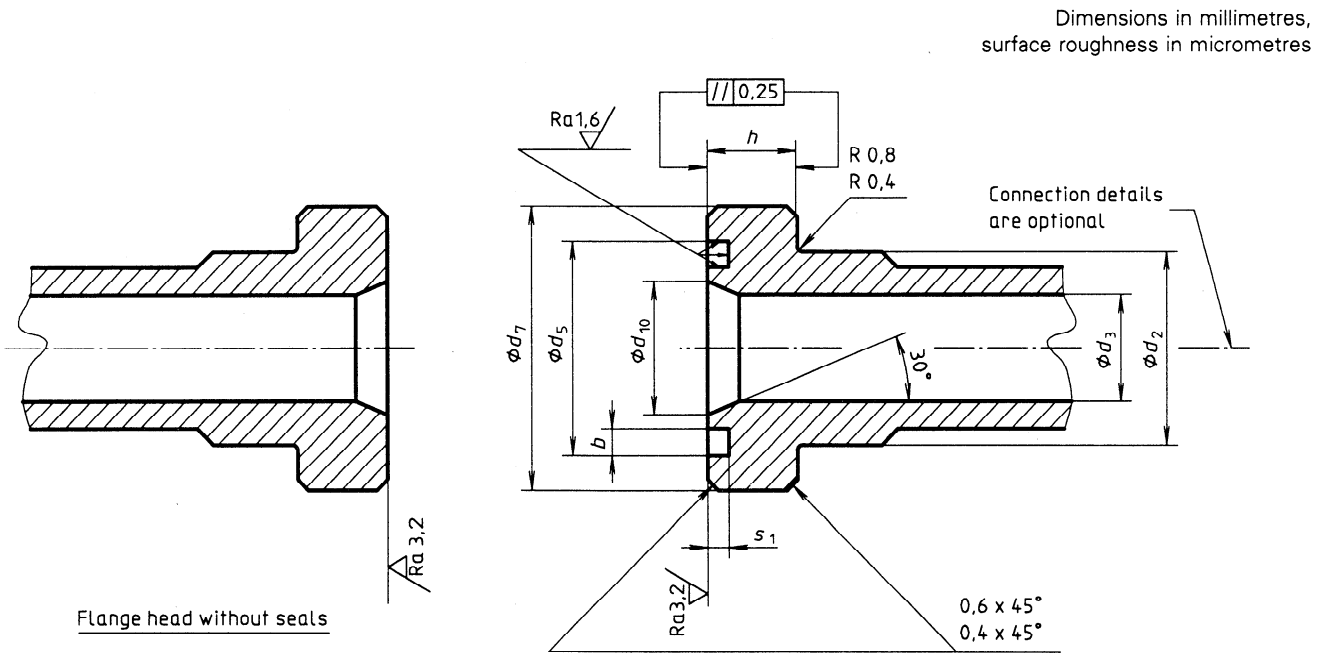


Figure 5 — Flange head with and without groove for O-rings (see tables 5 and 6)

Table 5 — Dimensions of flange heads for flanges — 25 MPa (250 bar) series

Dimensions in millimetres

Nominal flange size DN	b $\pm 0,25$	d_2 max.	d_3 max.	d_5		d_7 $\pm 0,25$	d_{10}	h $\pm 0,15$	O-ring		s_1 $\begin{matrix} 0 \\ -0,1 \end{matrix}$
				max.	min.				m nom.	n nom.	
10	3,2	18	12,5	22,05	21,90	24,5	14	6,8	17	2,65	2,2
13	4,2	24	15	25,65	25,50	30,2	16	6,8	19	3,55	2,9
19	4,2	31,5	20	31,75	31,60	38,1	22	6,8	25	3,55	2,9
25	4,2	38	25	39,25	39,10	44,5	27	8	32,5	3,55	2,9
32	4,2	43	32	44,15	44,00	50,8	34	8	37,5	3,55	2,9
38	4,2	50	38	53,9	53,7	60,4	40	8	47,5	3,55	2,9
51	4,2	62	47	62,7	62,5	71,4	50	9,6	56	3,55	2,9
56	4,2	76	58	75,5	75,3	87,2	60	12	69	3,55	2,9
63	4,2	90	70	91,3	91,1	101,6	74	15	85	3,55	2,9

Table 6 — Dimensions of flange heads for flanges — 40 MPa (400 bar) series

Dimensions in millimetres

Nominal flange size DN	b $\pm 0,25$	d_2 max.	d_3 max.	d_5		d_7 $\pm 0,25$	d_{10}	h $\pm 0,15$	O-ring		s_1 $\begin{matrix} 0 \\ -0,1 \end{matrix}$
				max.	min.				m nom.	n nom.	
10	3,2	18	11	22,05	21,90	26	13	7,8	17	2,65	2,2
13	4,2	24	14	25,65	25,50	31,8	15	7,8	19	3,55	2,9
19	4,2	32	18	31,75	31,60	41,3	19	8,8	25	3,55	2,9
25	4,2	38	22	39,25	39,10	47,6	24	9,5	32,5	3,55	2,9
32	4,2	44	29	44,15	44,00	54	32	10,3	37,5	3,55	2,9
38	4,2	51	35	53,9	53,7	63,5	38	12,6	47,5	3,55	2,9
51	6,7	67	43	65,7	65,5	79,4	46	12,6	56	5,3	4
56	6,7	80	53	78,8	78,6	94,2	56	16,5	69	5,3	4
63	6,7	90	58	84,8	84,6	104	59	18	75	5,3	4
70	6,7	102	63	94,6	94,4	119	65	20	85	5,3	4
80	6,7	114	74	97,0	96,8	131	76	23,5	87,5	5,3	4

Annex A (informative)

Equivalent SAE²⁾ O-rings

Table A.1 gives a list of O-rings conforming to SAE J120 that are equivalent to O-rings complying with ISO 3601-1.

Table A.1

Dimensions in millimetres

O-rings	
ISO 3601-1	SAE
17 × 2,65	17,12 × 2,62
19 × 3,55	18,64 × 3,53
25 × 3,55	24,99 × 3,53
32,5 × 3,55	32,92 × 3,53
37,5 × 3,55	37,69 × 3,53
47,5 × 3,55	47,22 × 3,53
56 × 3,55	56,74 × 3,53
69 × 3,55	69,44 × 3,53
85 × 3,55	85,32 × 3,53
56 × 5,3	56,52 × 5,33
69 × 5,3	69,22 × 5,33
75 × 5,3	75,57 × 5,33
85 × 5,3	85,09 × 5,33
87,5 × 5,3	88,27 × 5,33

2) Society of Automotive Engineers.

Annex B (informative)

Bibliography

- [1] ISO 286-2:1988, *ISO system of limits and fits — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts.*
- [2] ISO 6162:1994, *Hydraulic fluid power — Four-screw split-flange connections for use at pressures of 2,5 MPa to 40 MPa (25 bar to 400 bar) — Type I metric series and type II inch series.*
- [3] ISO 1101:1983, *Technical drawings — Geometrical tolerancing — Tolerancing of form, orientation, location and run-out — Generalities, definitions, symbols, indications on drawings.*
- [4] ISO 1302:1992, *Technical drawings — Method of indicating surface texture.*

ICS 23.100.30

Descriptors: hydraulic fluid power, hydraulic equipment, fluid circuits, flange connections, pipe flanges, square flanges, specifications, dimensions.

Price based on 11 pages
